DOCUMENT RESUME

ED 040 053 SE 008 429

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TITLE	IPI Science Today.
INSTITUTION	Pittsburgh Univ., Pa. School of Education.
PUB DATE	15 Mar 70
NOTE	10p.; Paper presented at Annual Meeting of the National Science Teachers Association (18th, Cincinnati, Ohio, March 13-17, 1970)
EDRS PRICE	EDRS Price MF-$0.25 HC-$0.60
DESCRIPTORS	Behavioral Objectives, *Curriculum Development, *Elementary School Science, *Individual Instruction, *Instruction, Program Descriptions, Student Attitudes
IDENTIFIERS	*Individually Prescribed Instruction

ABSTRACT

The paper related what has been accomplished during the past six years in the development of IPI Science at the Learning Research and Development Center, University of Pittsburgh. There have been three major accomplishments: (1) Goals for the program have been established, (2) The serious problems that face a group of curriculum developers attempting to individualize a science program have been identified. The problems are of two major types: (a) Those of a practical nature; e.g. How can science instruction be given on an individual basis to first graders who do not read? (b) Those of a philosophical nature; e.g. Is an individualized model of instruction compatible with the goals of science education? (3) Lesson materials and equipment for A and B Levels have been developed. Each Level comprises about one year's work in a system where a student has science for two 40-minute periods per week. Presented is a description of student progresses through various stages in a mainstream continuum. Once the necessary prerequisites are mastered, the student begins work in the A Level by taking a Mini-Placement Test. He continues through A and B Level mainstream units, taking only those lessons whose objectives he has not mastered on the various Mini-Placement Test. Alternative modes of instruction are available. (BR)

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IPI SCIENCE TODAY*

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This paper will relate what has been accomplished during the past six years in the development of IPI Science at the Learning Research and Development Center, University of Pittsburgh. There have been three major accomplishments:

1. Goals for the program have been established.

2. The serious problems that face a group of curriculum developers attempting to individualize a science program have been identified. The problems are of two major types:

   a. Those of a practical nature e.g. How can science instruction be given on an individualized basis to first graders who do not yet read?

   b. Those of a philosophical nature e.g. Is an individualized model of instruction compatible with the goals of science education?

3. Lesson materials and equipment for A and B Levels have been developed. Each level comprises about one year's work in a system where a student has science for two 40-minute periods per week.

A description of the first accomplishment appears in detail elsewhere. This paper will examine the compatibility of the goals with the instructional model and describe the concrete results of the development effort thus far.

A clear distinction must be made between the instructional model and the science curriculum before an examination of the compatibility of the science

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*Based on a paper by Audrey B. Champagne presented at the National Science Teachers Association 18th Annual Convention, Cincinnati, Ohio, 15 March 1970.

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goals with the instructional model can be made. IPI, Individually Prescribed Instruction, is an instructional model. It has a philosophical basis, a statement of goals, as well as very practical guidelines for classroom management. The instructional model is characterized by:

1. Students who are actually engaged in planning, evaluating and carrying out their own learning activities.
2. Teachers who guide the learning of individual students.
3. Subject matter which has been analyzed and hierarchically ordered.
4. Objectives which are stated behaviorally.
5. Goals which express concern for what the student will learn as well as a concern for the student's attitude toward learning.

Considering the goals of IPI Science in terms of the characteristics of the instructional model reveals that, in terms of the role which the student plays in the learning process (student self-direction and student co-evaluation) the model and curriculum are the same and, in fact, only in an individualized program can these goals of IPI Science be realized. The instructional model is necessary to the realization of the curricular goals.

A potential incompatibility of the instructional model and the science curriculum is revealed when content is considered. The instructional model implies that all students will master the same highly structured and ordered content and that each student will progress at his own rate. The model provides for individualization largely in terms of rate. To a limited extent there is individualization in terms of the kinds of materials available that teach to the same objective. The proposed science curriculum provides the student with opportunities to make choices. He may, within limits, choose the content he will study and the way in which he will study it. The proposed curriculum will

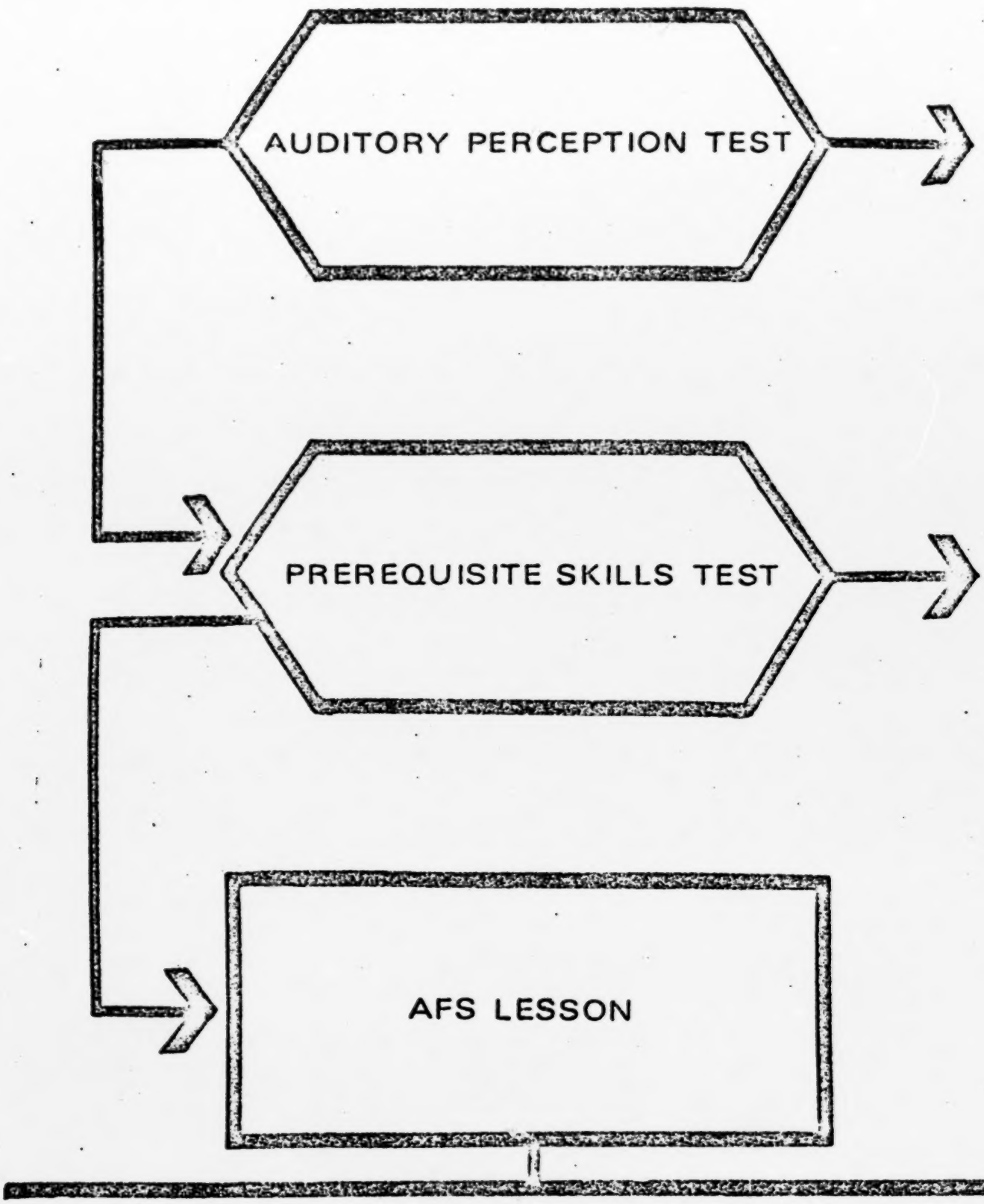
provide the student with mainstream activities which will be in the structured and ordered image of the instructional model. However, as the student progresses through the system, he will be provided with more and more opportunities to make choices from the alternative activities. Thus the mainstream of the science program will adhere closely to the instructional model and the alternative pathways will represent a departure from the instructional model.

Choices in terms of content are limited in the A and B levels as are choices of alternative modes of instruction. The instructional model is therefore most closely followed in these levels.

The late kindergartener or first grader's first experience with IPI Science is an Auditory Perception test (See Figure 1). A majority of the student's instruction in the A and B Levels utilizes a cassette-tape recorder. Therefore, it is crucial to his success in the program that he can hear and interpret directions he receives through earphones. The student who has demonstrated a level of performance judged insufficient for him to function in the auditory mode is given instruction to bring his auditory perception skills to a level where he can benefit from such instruction. Along with the ability to process auditory information, there are other skills the student must possess if he is to be successful in the science program. For example, he must be able to recognize certain letters and numerals, he must be able to respond to a direction like "draw a line under," etc. Skills like these are tested in the Prerequisite Skills test. Some students require instruction in these skills before they can begin science instruction.

When a student has shown competency in the auditory perception and the prerequisite skills, he is given a series of Audio Frame System (AFS) lessons. At this point it is necessary to digress and describe in more detail how the

MAINSTREAM



A LEVEL

FIGURE 1

student receives instruction in A and B Levels. Each student has a tape machine and a set of earphones. The student must place the tape in the machine properly, be sure the tape is completely rewound, and know how to start the tape. There are places in the lesson where the tape stops to give the student an opportunity to carry out manipulations or write answers. The technical system of the tape machine allows for the tape to be stopped automatically at these points. The student must then know how to start his tape again when he has finished the task. When the student has mastered the operation of his tape machine, he is ready to begin IPI Science.

The instructional model requires that the student be pretested on all the objectives in any given unit. These pretests are called Mini-Placement tests (see Figure 2). There are several Mini-Placement tests in each level. One Mini-Placement test usually covers the objectives for several units. Each lesson has an objective and each of the objectives is pretested. A student who gets all items on the Mini-Placement test correct, does not take any of the lessons covered by that test. The student who succeeds on some items but not on others takes only those lessons corresponding to items he missed on the Mini-Placement test. After the placement test has been scored, the teacher knows exactly what lessons in each unit the student must take.

There are two sets of units where the student may begin instruction in the A level. He may take Mini-Placement test 2 before he takes test 1. When he has mastered those units covered by Mini-Placement test 2 he goes to test 1. Before he can go into the units covered by Mini-Placement 3 he must have mastered those units covered by Mini-Placement 2, since some information in these units is prerequisite to the lessons in the last set of units. After a student has mastered the A level, he goes into the B level, which uses the

MAINSTREAM

A LEVEL

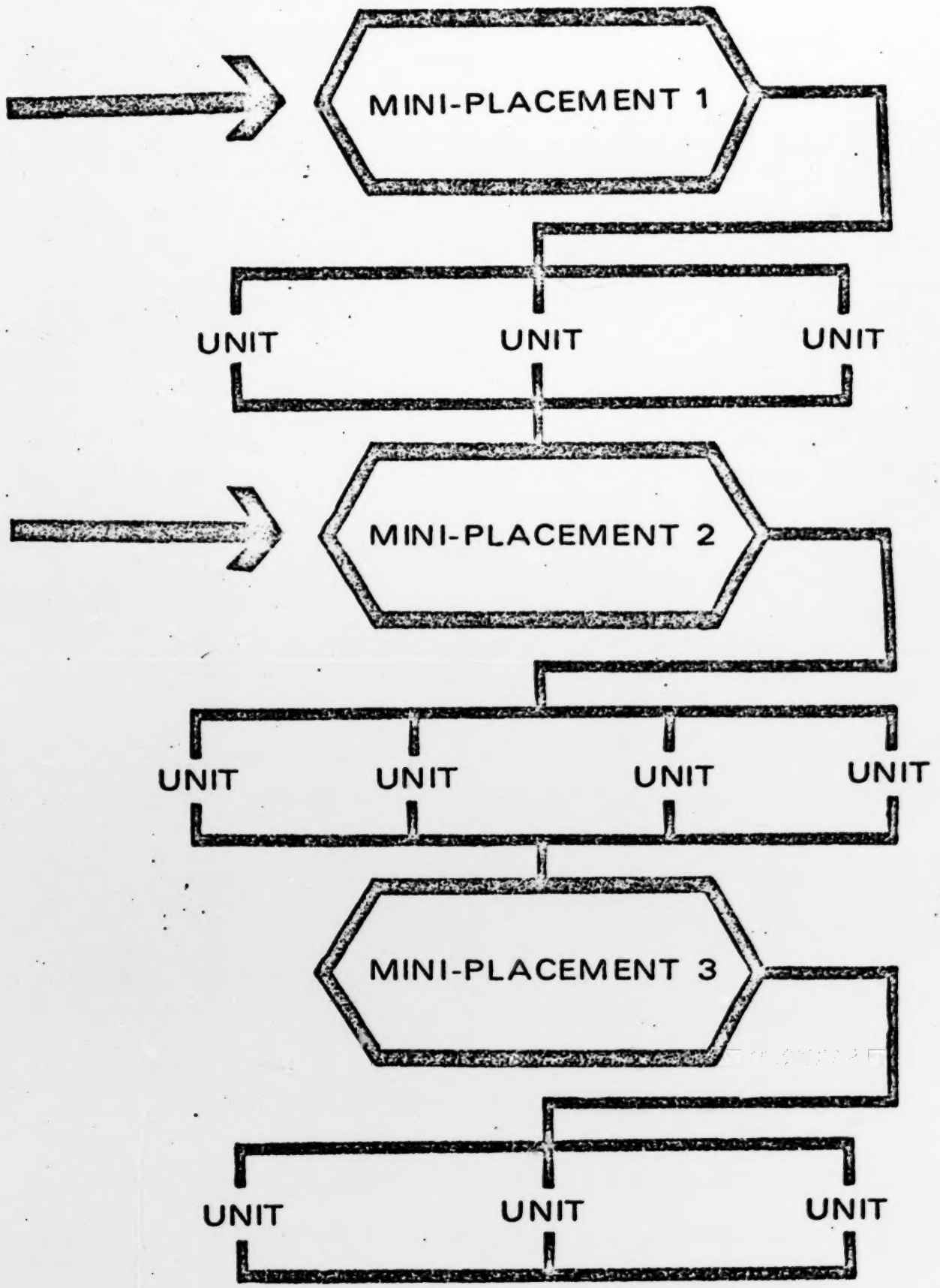


FIGURE 2

MAINSTREAM

B LEVEL

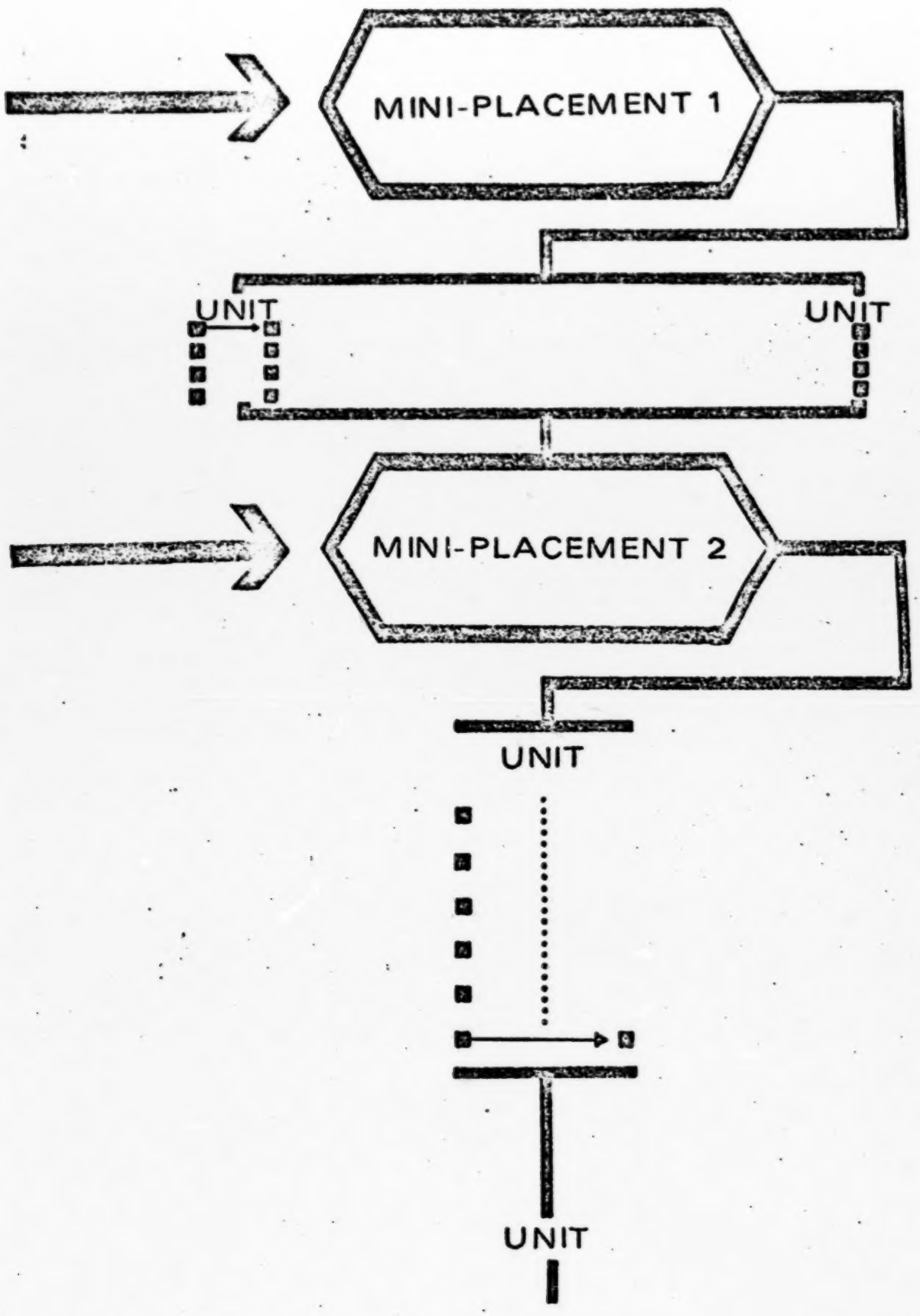


FIGURE 3

same Mini-Placement test system to determine what content the student has mastered before he starts the lessons (see Figure 3). There are fewer units in the B level but each unit has more lessons than do units in the A level. This discussion has shown the operation of the model within levels, a consideration of the operation of the model within a unit follows.

Each lesson has included in it Curriculum Embedded Test (CET), which tests the student's mastery of the objective to which that lesson teaches (see Figure 4). If after having taken the lesson, the student does not attain mastery on the CET, he may be recycled through the lesson or he may be prescribed further instruction using an alternative mode of instruction. Alternative modes of instruction presently available include: teacher tutoring, peer tutoring, Directed Group Activities (DGA) and Student Activities (SA) on which individual or small groups of children may work, and Science Learning Games (SLG). Any one or a combination of these alternative forms of instruction can be used when the child fails to master the Individual Taped Lesson (ITL).

DGA's and SA's are not designed simply to provide further instruction to those children who are not mastering lessons in the mainstream. DGA's and SA's have been designed as enrichment and extension activities. Likewise, experience with the program has shown that certain science learnings require group activities; there are several places in the A and B Levels where DGA's appear as a required part of mainstream.

An alternative mode of instruction is currently being developed. These lessons, Individual Lessons (IL's), which the student will read are to be introduced in the C level of the program. Students then will be able to choose taped or written versions of the same lesson in C level. Taped lessons will be discontinued after C level.

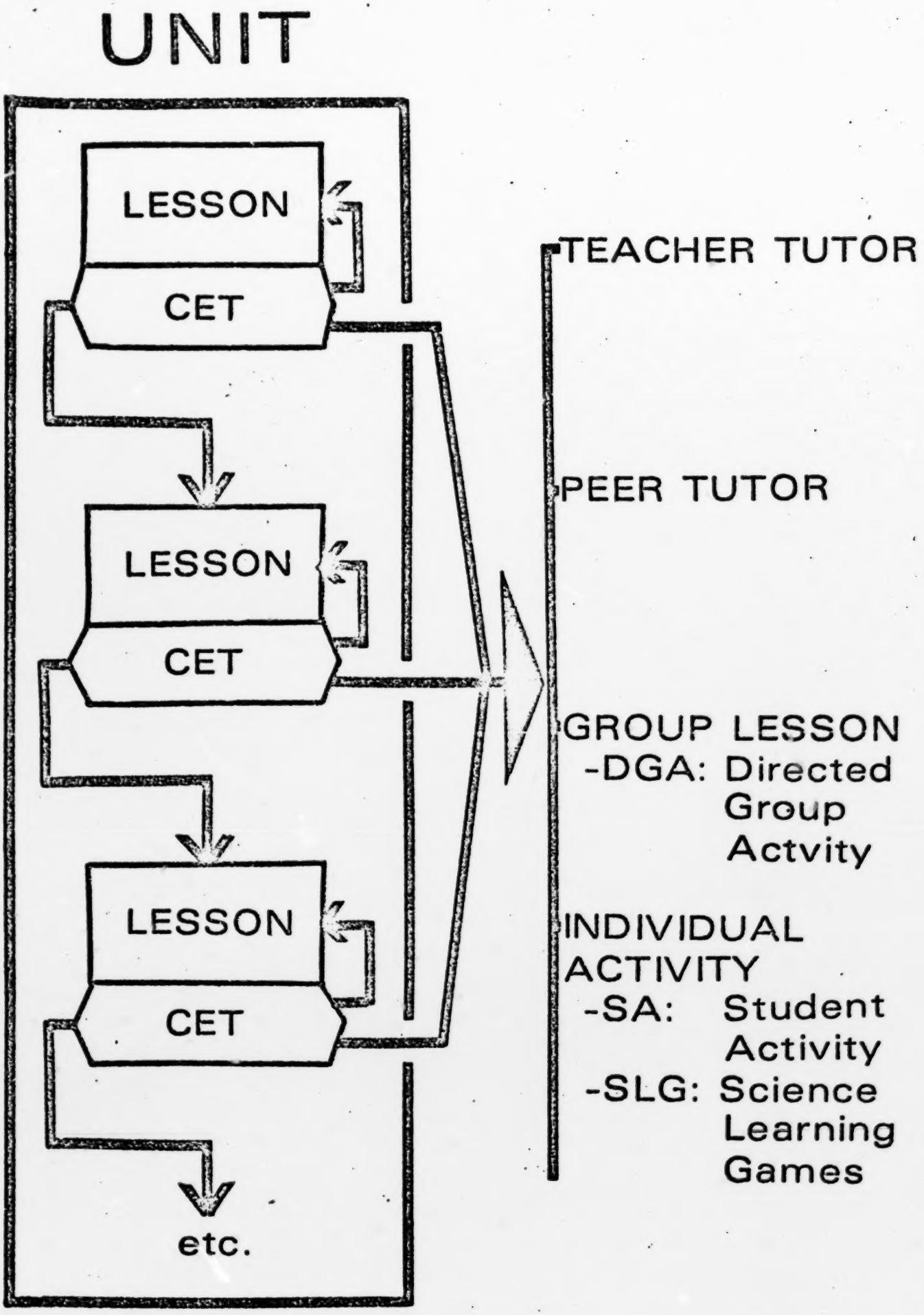

UNIT
LESSON
CET
LESSON
CET
LESSON
CET
etc.
TEACHER TUTOR
PEER TUTOR
GROUP LESSON
-DGA: Directed Group Actvity
INDIVIDUAL ACTIVITY
-SA: Student Activity
-SLG: Science Learning Games

FIGURE 4

This has been an attempt to show how a student, working in IPI Science, progresses through various stages in a mainstream continuum. Once the necessary prerequisites are mastered, the student begins work in the A level by taking a Mini-Placement test. He continues through A and B Level mainstream units, taking only those lessons whose objectives he has not mastered on the various Mini-Placement tests. Alternative modes of instruction are also available; others are currently being developed.